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NOBLESVILLE ROAD IMPACT FEE ZONE IMPROVEMENT PLAN

CITY OF NOBLESVILLE

MARCH 2024

CERTIFICATION

I certify that this **ROAD IMPACT FEE ANALYSIS** has been prepared by me and under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

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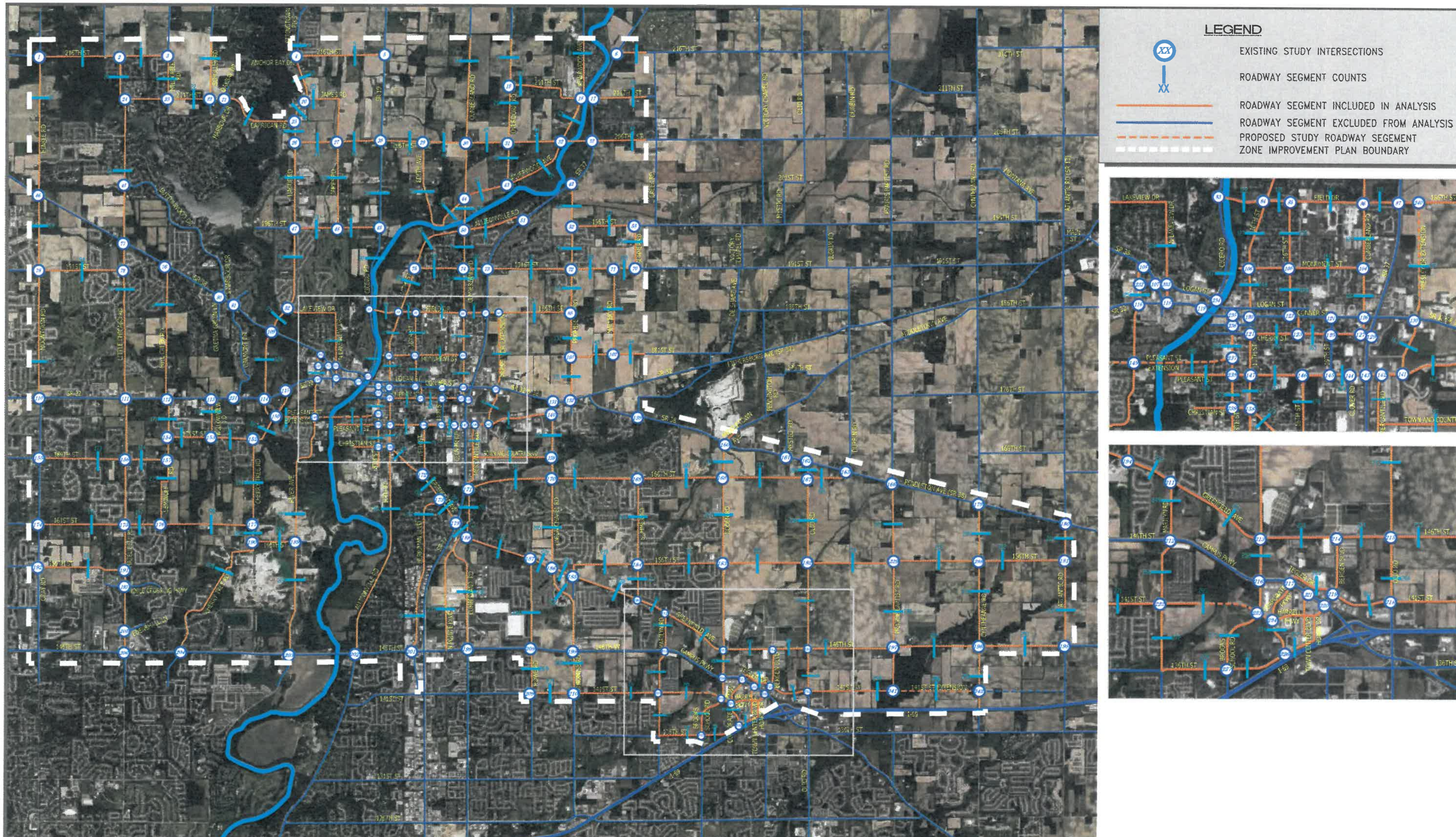

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CITY OF NOBLESVILLE
ZONE IMPROVEMENT PLAN
STUDY AREA ROADWAY NETWORK

FIGURE 1

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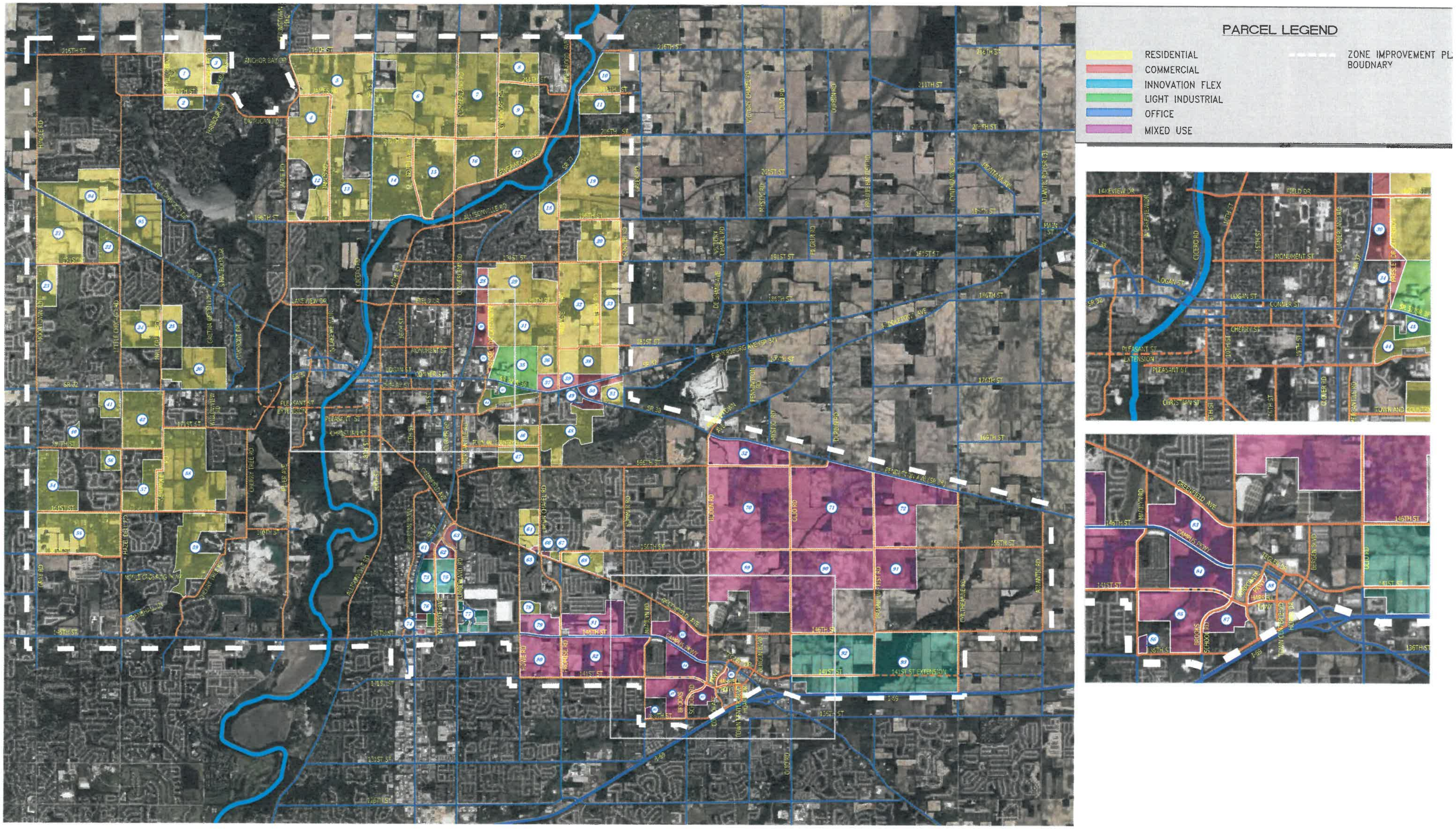

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CITY OF NOBLESVILLE
ZONE IMPROVEMENT PLAN
VACANT LAND PARCELS

FIGURE 2

INTRODUCTION

The City of Noblesville has undertaken a project to determine the amount of the Road Impact Fee that can be assessed against future developments that could be constructed within the City's limits over the next ten years. This analysis will project and evaluate the future impact of these developments on the roadway system. This report will serve as a Zone Improvement Plan for the study area.

In order to develop a meaningful road impact fee study, the Rational Nexus Theory was implemented. The Rational Nexus Theory states that new developments cannot be held responsible for the existing inadequacy of the existing street system. Therefore, this Zone Improvement Plan was developed in two separate parts. The first part determined the existing functionality of the intersections and roadways in the study area. Costs were then assigned to all intersection and roadway improvements that were needed to allow these intersections and roadways to function at the baseline levels of service with the existing traffic volumes. The second part of the analysis determined the traffic volumes that would be generated by the vacant parcels of land within the study area that could be developed over the next 10-year period. The generated traffic volumes were then assigned to the street system within the study area. The projected future traffic volumes were used to analyze the roadway system to determine the intersection and roadway improvements that would be necessary to accommodate the added traffic volumes and achieve the baseline levels of service. Cost estimates were then conducted for the recommended improvements. The road impact fee was then calculated by dividing the estimated cost to mitigate 10-year traffic volumes by the number of 24-hour weekday trips generated by the 10-year proposed developments identified by the City of Noblesville planning staff. This amount is the cost the development community will be required to fund to meet the future intersection and roadway needs of the City.

In determining the results of this analysis, A&F Engineering has followed acceptable traffic and transportation engineering methodologies and has completed this Zone Improvement Plan by following the Rational Nexus Theory to its complete understanding.

PURPOSE

The purpose of this project is as follows:

Existing Conditions – Review the major street network as it presently exists within the study area. If necessary, intersection and roadway improvements will be recommended based on the existing traffic volumes. Estimated construction costs will be determined for the corresponding intersection and roadway improvements.

Projected 10-Year Conditions – Estimate the trips that could be generated by the 10-year completely and partially vacant parcels of land as identified by the City of Noblesville planning staff within the study area. These trips will then be added to the existing traffic volumes to estimate the 10-year traffic volumes that will utilize the City's roadway system. Intersection and roadway improvements will then be recommended based on these future traffic volumes. Estimated construction costs will be determined for the corresponding intersection and roadway improvements.

Road Impact Fee – Calculate the road impact fee based on the estimated construction costs to mitigate existing conditions, projected 10-year conditions, and the projected 24-hour weekday trips that will be generated by the 10-year vacant land parcels.

STUDY AREA

The study area for this Zone Improvement Plan has been determined based on guidelines set by the City of Noblesville. **Figure 1**, located at the front of this report, shows the Zone Improvement Plan boundary and the intersections and roadway segments that are included in the study area.

In order to create the 10-year traffic volumes, trips must be generated from vacant parcels within the study area. The City of Noblesville planning staff identified completely and partially vacant land parcels that would be developed within the next ten years and how they would develop. **Figure 2** shows the location and land uses of the vacant land parcels in reference to the study area roadway network.

HISTORICAL ROADWAY FUNDING SOURCES

Historically, the City of Noblesville has used various sources to fund road expenditures. These include the General Fund, Motor Vehicle Highway Distributions, Downtown Funds, Previously Collected Road Impact Fees, Bonds, LOIT Funds, Utility Funds, and Tax Incremental Financing Funds. **Table 1** is a summary of the funds received from each source over the past five years.

TABLE 1 – HISTORICAL ROADWAY FUNDING SOURCES

Source	2019	2020	2021	2022	2023	Total
General Fund	Outlined in previous Road Impact Fee Update Dated December 2021	$780,423.55	$4,550.32	$3,500.60	$405,472.04	**$1,193,946.51**
MVH Distribution		$888,673.95	$606,300.97	$500,963.38	$209,283.04	**$2,205,221.34**
Downtown		$0.00	$84,521.25	$830,076.80	$29,958.20	**$944,556.25**
Impact Fees		$210,380.32	$2,588,069.51	$4,186,353.12	$1,164,506.02	**$8,149,308.97**
Bonds		$475,101.76	$12,118,955.28	$14,295,165.88	$20,060,306.18	**$46,949,529.10**
LOIT		$0.00	$11,350.00	$0.00	$0.00	**$11,350.00**
Utility (Storm)		$0.00	$205,887.33	$22,174.94	$766,486.00	**$994,548.27**
TIF		$982,582.02	$1,130,048.35	$402,855.82	$463,848.52	**$2,979,334.71**
Total	---	**$3,337,161.60**	**$16,749,683.01**	**$20,241,090.54**	**$23,099,860.00**	**$63,427,795.15**

SCOPE OF WORK

The scope of work for this analysis is as follows:

Existing Conditions

1. Determine the existing traffic volumes at all intersections and along all roadway segments.
   a. Acquire weekday AM and PM peak hour Streetlight traffic count data at the existing study area intersections.
   b. Acquire weekday Streetlight 24-hour traffic count data (Annual Daily Traffic Volumes [ADT]) along the existing study area roadway segments.
2. Inventory all existing study area intersections to determine traffic control and intersection geometrics.
3. Inventory all existing roadway segments to determine number of lanes, lane widths, and speed limits.
4. Prepare a capacity analysis for each intersection and each roadway segment using existing geometrics, existing traffic controls and existing traffic volumes. The capacity analysis will provide levels of service for each of the intersections and roadway segments which can be compared to the acceptable baseline level of service standards.
5. Make recommendations to improve the intersections and roadway segments that are below acceptable baseline levels of service to meet or exceed the baseline levels of service.
6. Estimate construction costs based on the corresponding intersection and roadway improvements needed to provide the baseline level of service for the existing traffic volumes.

Projected 10-Year Conditions

1. Based on input from the City of Noblesville planning staff, identify all vacant and partially vacant parcels of land within the study area and confirm the potential future land uses and densities for those parcels.
2. Estimate the number of AM peak hour and PM peak hour trips that will be generated by the potential use of each of these parcels.
3. Assign and distribute the generated trips for the AM and PM peak hour periods throughout the street system.
4. Determine the total AM and PM peak hour generated trips from the vacant parcels at each intersection and along each roadway segment within the study area roadway network.
5. Add the generated trips to the existing traffic volumes to develop 10-year traffic volume estimates.
6. Prepare a capacity analysis for each intersection and each roadway segment using the projected 10-year traffic volumes. The capacity analysis will provide levels of service for the roadway segments and intersections which can be compared to the acceptable baseline level of service standards.
7. Make recommendations to improve the intersections and roadway segments that are below the acceptable baseline levels of service to meet or exceed the baseline levels of service.
8. Estimate construction costs based on the corresponding roadway and intersection improvements needed to accommodate the projected 10-year traffic volumes.

Road Impact Fee Calculation

1. Estimate the 24-hour weekday trips that will be generated by the potential use of each vacant parcel.
2. Determine the construction costs associated with bringing the intersections and roadway segments to acceptable baseline levels of service for existing and 10-year traffic volume scenarios. The total road impact fee cost is then calculated from the difference in the 10-year construction costs and existing constructions costs and then adding the cost to perform the road impact fee study. This yields the total road impact fee cost.
3. Finally, divide the total road impact fee cost by the total 24-hour weekday trips generated by the identified vacant land parcels to yield the road impact fee per 24-hour weekday trip.

EXISTING TRAFFIC DATA

Existing turning movement traffic volume counts were obtained at the analysis intersections using Streetlight connected vehicle data within the Zone Improvement Area. The counts include an hourly total of all "through" traffic and all "turning" traffic at the intersection. The counts were made during the hours of 6:00 AM to 9:00 AM and 3:00 PM to 7:00 PM using data from April 2022 to October 2022. The "Intersection Volumes" tables shown in **Exhibit A** summarize the existing traffic volumes for the peak hours. The raw Streetlight data output sheets for the intersection traffic counts are included in **Appendix A**.

Directional traffic volume counts were obtained along the analysis roadway segments using Streetlight connected vehicle data within the Zone Improvement Area. These counts consider the average daily and AM and PM peak hour traffic volumes on Tuesdays, Wednesdays, and Thursdays from April 2022 to October 2022 to yield the roadway segment "Average Daily Traffic" (ADT). The "Segment Volumes" tables in **Exhibit B** summarize the existing traffic volumes for the peak hours and the ADT obtained from the roadway segment traffic counts. The raw data sheets for the roadway segment traffic counts are included in **Appendix B.**

Streetlight traffic volume data was previously validated as accurate by A&F Engineering and the Indianapolis Metropolitan Planning Organization.

EXISTING INTERSECTION INVENTORY

The following characteristics were identified for each study intersection within the study area:

- Traffic Controls
- Intersection Geometrics

EXISTING ROADWAY SEGMENT INVENTORY

Each study roadway within the study area was identified by dividing the roadway into analyzed segments. In general, each roadway segment was chosen based on a major change in traffic conditions or roadway characteristics. The characteristics that were included in the roadway segment analyses are:

- Number of Lanes
- Roadway Segment Length
- Speed Limits
- Percent No-Passing Zones
- Presence of Median or Passing Lanes

VACANT LAND PARCELS – PROPOSED USES

The vacant parcels of land included in this analysis and identified by the City of Noblesville planning staff are illustrated in **Figure 2**. The individual land uses and densities that could be built out in the next 10 years on these parcels were determined based on information provided by the City of Noblesville planning staff.

GENERATED TRIPS

An estimate of generated traffic from each of the 10-year vacant parcel developments is a function of the size and character of each land use. The *ITE Trip Generation Manual (11th Edition)*[1] was used to calculate the total number of trips expected to be generated by each land use during the AM peak hour, PM peak hour, and 24-hour weekday period. The *ITE Trip Generation Manual* is a compilation of trip data for various land uses as collected by transportation professionals throughout the United States in order to establish the average number of trips generated by those land uses.

Based on the information provided by the City of Noblesville's planning staff as well as data taken from *ITE Trip Generation Manual (11th Edition)*, the classifications and descriptions for each of the vacant parcel developments applicable to this study are as follows:

Single-Family Detached: Single family detached land uses are defined as being composed of single-family detached homes on individual lots. A typical example of this land use is a suburban subdivision.

Single-Family Attached: Single family attached land uses are defined as single-family attached homes that share a wall with an adjoining home. A typical example of this land use is duplex or town/rowhouses.

Multifamily: Multifamily housing generally includes apartments and condominiums located within the same building with at least three other dwelling units and that have two or three levels (floors).

[1] *Trip Generation Manual*, Institute of Transportation Engineers, Eleventh Edition, 2021.

Business Park: A business park typically consists of flex-type or incubator one- or two-story buildings served by a common roadway system with flexible tenant spaces, which lends itself to a variety of uses. The rear side of the building is often served by a garage door. Tenants may be start-up companies or small mature companies that require a variety of space including offices, retail and wholesale stores, restaurants, recreational areas and warehousing, manufacturing, light industrial, or scientific research functions.

General Light Industrial: A general light industrial facility is typically devoted to a single use with an emphasis on activities other than manufacturing such as printing, material testing, and assembly of data processing equipment and typically has minimal office space.

General Office: General office land uses typically have multiple tenants and are locations where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted.

General Retail: The general retail land use includes neighborhood centers, regional shopping centers, and area service nodes that are planned, developed, owned, and managed as a shopping center.

INTERNAL TRIPS

Mixed-use developments typically generate internal trips between the individual land uses within the development. These internal trips do not access the public street system; therefore, they are not included in the capacity calculations. For the mixed-use developments considered in this report, the internal trip reduction rates outlined in the *ITE Trip Generation Handbook* were applied.

PASS-BY TRIPS

The retail land uses considered in this analysis will attract pass-by trips. Pass-by trips are trips already in the existing flow of traffic that enter the development, utilize the development, and then return to the roadway system. *ITE Trip Generation Handbook*[2] provides procedures, methodology, and data that can be used to estimate the number of pass-by trips generated by the retail land uses.

[2] *Trip Generation Handbook*, Institute of Transportation Engineers, Eleventh Edition, 2021.

Assignment & Distribution of Generated Trips

To determine the volume of traffic that will be added to the study area roadway network, the generated traffic must be assigned and distributed by direction to the public roadway at its intersection with the development access points, and then to each of the intersections throughout the study area. For each of the vacant parcels within the study area, the assignment and distribution of the generated trips were based on the existing traffic patterns, the location of population and employment centers in relation to the individual parcels, and the proposed street system within the study area. The assignment and distribution of the generated traffic for each parcel was expedited by using *PTV VISUM 22*[3], a state-of-the-art transportation planning software package that utilizes origin-destination pairs and allows for changes in the roadway system and driver behavior to be considered when future traffic flows are determined.

Projected 10-Year Traffic Volumes

Information provided by the City of Noblesville planning staff was used to develop land use and density determinations for each parcel of vacant land. The generated traffic volumes from each parcel were totaled for both the AM peak hour and the PM peak hour at each of the study intersections and roadway segments. These generated volumes were then added to the existing traffic volumes at each intersection and roadway segment to obtain the 10-year traffic volumes. The projected 10-year traffic volumes are summarized for the AM peak hour and PM peak hour for each intersection on the "Intersection Volumes" tables in **Exhibit A** and for each roadway segment on the "Segment Volumes" tables in **Exhibit B**.

Pleasant Street Extension Project

Included within the traffic model is the proposed Pleasant Street Extension. This project will provide an additional east-west corridor crossing the White River in order to relieve traffic congestion in downtown Noblesville along SR 32. The project includes improvements to the existing Pleasant Street Corridor from SR 37 to the intersection of Hague Road and SR 32. The Pleasant Street Extension project is anticipated to be funded by several entities and multiple funding sources. **Table 2** shows the combined material, construction, and engineering costs associated with different phases of the Pleasant Street Extension project.

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[3] *PTV VISUM 2022.01-12*, PTV Group, 2022.

TABLE 2 – PLEASANT STREET EXTENSION COST SUMMARY

Construction Breakdown	Costs
Hague Road/SR 32 to 19th Street	$44,101,730
19th Street to SR 37	$35,313,200*

*These costs have been excluded under the assumption that the majority or all of the costs could be funded by entities outside of the City of Noblesville.

Because the Pleasant Street Extension Project will mitigate existing deficiencies within the roadway network and will provide future capacity for 10-year traffic projections; these costs are shared 50/50 between existing and 10-year costs.

TRAFFIC SIGNAL WARRANT ANALYSIS

Peak Hour Traffic Signal Warrant analyses were conducted at two-way stop and all-way stop controlled intersections where the minor streets or the total intersection have been shown to operate below acceptable baseline levels of service to determine if the installation of a traffic signal or the construction of a roundabout should be considered under existing and/or 10-year conditions.

CAPACITY ANALYSIS

The "efficiency" of an intersection or roadway segment is based on its ability to accommodate the traffic volumes that approach the intersection or that travel along the roadway segment. It is defined by the Level-of-Service (LOS) of the intersection or roadway segment. The LOS is determined by a series of calculations commonly called a "capacity analysis". Input data into a capacity analysis include traffic volumes, intersection geometry, number and use of lanes, and, in the case of signalized intersections, traffic signal timing. To determine the LOS at each of the study intersections, a capacity analysis has been made using the recognized computer program *Synchro 11*[4]. This program allows multiple intersections to be analyzed and optimized using the capacity calculation methods outlined within the *Highway Capacity Manual (HCM 6th Edition)*[5]. To determine the LOS at each of the roadway segments, a capacity analysis has been performed using the computer program *HIGHPLAN,* which uses the capacity calculation methods outlined within the *Highway Capacity Manual (HCM)* for two-lane and multi-lane roadway segments.

[4] *Synchro/SimTraffic 11*, Cubic Transportation Systems, 2021.

[5] *Highway Capacity Manual Sixth Edition (HCM)* Transportation Research Board, The National Academies of Sciences, Washington, DC, 2017.

DESCRIPTION OF LEVEL OF SERVICE – INTERSECTIONS

The Level of Service (LOS) for an intersection is based on the average control delay (in seconds) that a vehicle would typically experience at the intersection. The following data obtained from the *Highway Capacity Manual (HCM)* describes the delay thresholds related to the levels of service for signalized intersections:

Level of Service A - describes operations with a very low delay, less than or equal to 10.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.

Level of Service B - describes operations with delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression. More vehicles stop than LOS A, causing higher levels of average delay.

Level of Service C - describes operation with delay in the range of 20.1 seconds to 35.0 seconds per vehicle. These higher delays may result from failed progression. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of Service D - describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combinations of unfavorable progression. Many vehicles stop, and the proportion of vehicles not stopping declines. This is the limit of acceptable delay.

Level of Service E - describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These high delay values generally indicate poor progression and long cycle lengths.

Level of Service F - describes operations with delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The following *Highway Capacity Manual (HCM)* tables, show the delays related to the levels of service for unsignalized, signalized, and roundabout intersections:

Level of Service	Control Delay (seconds/vehicle) UNSIGNALIZED	Control Delay (seconds/vehicle) SIGNALIZED/ROUNDABOUT
A	Less than or equal to 10	Less than or equal to 10
B	Between 10.1 and 15	Between 10.1 and 20
C	Between 15.1 and 25	Between 20.1 and 35
D	Between 25.1 and 35	Between 35.1 and 55
E	Between 35.1 and 50	Between 55.1 and 80
F	greater than 50	greater than 80

Description of Level of Service – Roadway Segments

The computer software *HIGHPLAN* was used to determine the Level of Service (LOS) for the two-lane roadway segments (one travel lane in each direction) and multilane roadway segments (more than one travel lane in each direction) in this study. In the *HIGHPLAN* software, the LOS for the two-lane roadway segments for urban/developed areas is based on the percentage free flow speed (the percentage of vehicular speed traveled in relation to the posted speed limit) that can be obtained over the roadway segment. For multilane roadway segments, the LOS is based on the density (passenger cars per mile per lane) of the roadway segment.

HIGHPLAN utilizes the following roadway variables in the determination of the LOS for two-lane and multilane roadway segments:

- Number of Lanes
- Roadway Segment Length
- Speed Limit
- Percent No-Passing Zone
- Presence of Median or Passing Lanes
- Average Daily Traffic (ADT)
- Directional Split of Peak Hour Traffic Volumes
- Peak Hour Factor (PHF)
- % Heavy Vehicles

The following tables show the criteria used by *HIGHPLAN* in determining the level of service for two-lane roadway segments and multilane roadway segments.

Level of Service Thresholds for Two-Lane Roadway Segments

Level of Service	Percentage of Free Flow Speed (%)	Minimum Speed (mph)
A	≥ 92	45
B	83-91.9	35
C	75-82.9	35
D	67-74.9	35
E	≤ 67	35
F	v/c ≥ 1.0	35

Level of Service Thresholds for Multilane Roadway Segments

Level of Service	Density (pc/mi/ln)	Speed (mph)
A	≤ 11	ALL
B	11.1-18	ALL
C	18.1-26	ALL
D	26.1-35	ALL
E	35.1-45	45-60
F	> 45	45-60

Baseline Level of Service Standards

The City of Noblesville has established a minimum acceptable baseline level of service (LOS) standard that was used when performing the capacity analyses for the study intersections and roadway segments. Level of service 'D' has been selected as the minimum acceptable baseline LOS for intersections and level of service 'E' as the minimum acceptable baseline LOS for roadway segments in this Zone Improvement Plan. This standard is used for both existing conditions and projected 10-year conditions.

In some cases, it was not feasible to achieve the baseline level of service for an intersection. For those intersections that operate below acceptable baseline levels of service (LOS E and F), maximum efforts have been made to improve the level of service to a minimum of D. However, due to the fact that reasonable designs are not sufficient to achieve acceptable baseline levels of service in some instances, no further mitigations were considered for those intersections. This methodology applies to existing and 10-year analyses.

In addition to the LOS standards for roadway segments, a maximum width standard is considered. In this standard, a 20-foot-wide roadway with a 2-foot shoulder was considered to be the minimum acceptable cross-section of a roadway segment. However, the costs associated with widening any width deficient roadway segments were not considered as it was assumed that the roadway segments will be widened as development occurs along the frontage of these roadways.

Recommended Improvement Criteria

Improvements were recommended for both the existing traffic volumes and the projected 10-year traffic volumes so that each study intersection/roadway segment will meet the minimum acceptable baseline level of service (LOS D/E). The recommended improvements only include those regarding the capacity of each study intersection/roadway segment. Road Impact Fees are calculated based on the improvements needed to enhance the capacity of each intersection/roadway segment, and the recommendations found in this report are based on improving said capacity. Typical improvements include: the addition of travel lanes, turn lanes, and changes in intersection control.

Summary Tables for Intersections

A tabular summary of the analysis considering each study intersection is shown in the following pages. The existing level of service (LOS) results are shown in **Table 1** under the heading "Existing LOS". The existing LOS results are based on the existing traffic control, existing intersection geometrics and the existing AM peak hour and PM peak hour traffic volumes. The existing intersection traffic volumes for the peak hours can be found in the intersection volume tables in **Exhibit A**.

Level of service "D" has been selected for this study by the City of Noblesville as the minimum acceptable baseline LOS for intersections. If necessary, mitigated conditions for the existing traffic volumes have been recommended for intersections that currently operate below the minimum acceptable baseline LOS. The resulting levels of service and recommended mitigations are shown in **Table 3** under the headings "Existing Mitigated LOS" and "Existing Mitigations/Notes", respectively.

If necessary, mitigated conditions have been recommended so that the intersections will operate at acceptable baseline levels of service (LOS D) during the peak hours with the projected 10-year traffic volumes. This includes intersection improvements that are planned/proposed by the City Noblesville that will be constructed over the next 10 years. The LOS results for the projected 10-year traffic volumes along with the corresponding mitigations are shown in **Table 4** under the headings "10-Year Mitigated LOS" and "10-Year Mitigations/Notes", respectively.